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14. ABSTRACT Joint Vision 2020 and the operational concepts of STOM and deep operations demonstrate the necessity for development of weapon systems to support combat operations over the entire depth of the battlespace. In support of these requirements, the Navy has undertaken the development advanced NSFS weapons that will be capable of providing a sustainable high volume rate of long range, precision fires in all weather conditions. Optimizing the employment of the advanced NSFS combat power will enable the operational commander to maximize economy of force and principle of mass. The challenge to optimizing the employment of advanced NSFS combat power resides in establishing unity of effort for fires and airspace deconfliction throughout the battlespace. The failure of joint doctrine to adequately address three critical deconfliction issues; delineation of the boundary between close and deep operations, designation of the control authority for fires in deep operations and the use of Killboxes, has resulted in doctrinal differences that pose unnecessary challenges to fires deconfliction. Expanding joint doctrine to address these battlespace challenges is critical to the employment and synchronization of joint fires from not only advanced NSFS weapons but extended range weapons of all services.					
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JOINT FIRE COORDINATION CHALLENGES IN OPTIMIZING EMPLOYMENT OF  
ADVANCED NSFS WEAPONS

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature\_\_\_\_\_

16 May 2003

## Introduction

Joint Vision 2020 outlines the operational guidelines of future warfare – dominant maneuver, precision engagement, full dimensional protection, and focused logistics. Future warfare will require lethal and protected forces to operate over a larger and deeper battlespace. Direct and indirect fires with extended range, greater accuracy, and greater lethality will be required to support these maneuver forces.<sup>1</sup> The U.S. Army's concept of deep operations and U.S Marine Corps' capstone concept of the early 21<sup>st</sup> Century, Expeditionary Maneuver Warfare, re-enforce the requirement to develop and employ weapons capable of supporting ground operations across the depth of the battlespace. In order to support the operational maneuver requirements of the 21<sup>st</sup> Century, the U.S. Navy is developing several advanced Naval Surface Fire Support (NSFS) weapons including the Extended Range Guided Munition (ERGM), Advanced Gun System (AGS), and upgraded variants of the Tomahawk Land Attack Missile (TLAM).<sup>2</sup> The increased range and accuracy of these advanced NSFS weapons provides the operational commander an effective joint fires alternative to employ as strategic fires or in support of combat operations deep into the battlespace. Optimizing the employment of advanced NSFS combat power allows the operational commander to maximize economy of force and principle of mass.

The challenge to optimizing the employment of advanced NSFS combat power resides in fires and airspace deconfliction throughout the battlespace as these weapons may cross several area of operations and coordination lines en route to its target. This challenge is further complicated by the failure of the services to formally define the physical boundary between close and deep operations and designate the control authority for joint fires in support of deep operations. The resultant ambiguity in joint doctrine is reflected in the

doctrinal differences in the application of Fire Support Coordinating Measures (FSCMs) between combatant commanders in their respective areas of responsibility. The root differences in application of FSCMs occur at the most critical area on the battlefield, the junction between deep and close operations. Careful consideration in planning and coordination is essential at this junction first and foremost to prevent fratricide and secondly to allow operational commanders to maximize economy of force, unity of effort, and the principle of mass. Failure of joint doctrine to adequately define the coordination requirements of joint fires beyond the Fire Support Coordination Line (FSCL) and the use of Killboxes present unnecessary challenges to coordination of joint fires, introducing increased risk of fratricide and potentially increased reaction time to the engagement of time critical targets. In general, modifying joint doctrine to properly address these issues can mitigate the risks while formalizing doctrine that will facilitate the employment of advanced NSFS weapons.

This thesis will be discussed by examining the relevance of advanced NSFS to current operational concepts of maneuver, the differences and shortfalls in service, combatant commander, and joint doctrine that support its employment, and recommendations for joint doctrinal changes to optimize its employment in joint fires.

#### The need for advanced NSFS.

The overarching focus of Joint Vision 2020's transformational effort is full spectrum dominance by the armed forces through the interdependent application of dominant maneuver, precision engagement, focused logistics and full dimensional protection.<sup>3</sup> Dominant maneuver requires joint forces obtain the ability "to gain positional advantage with decisive speed and overwhelming operational tempo to achieved assigned military tasks."<sup>4</sup>

Operational concepts such as the Marine Corps' Ship-to-Objective-Maneuver (STOM) and the Army's deep operations embody the basis of dominant maneuver and highlight the Navy's need for development and employment of advanced NSFS weapons.

STOM. The Marine Corps' operational concept changes the linear nature of amphibious operations by using technological advances in mobility and command and control systems to allow landing forces to rapidly maneuver from their launching platform's over the horizon attack positions directly to their inland objectives.<sup>5</sup> Launched from surface platforms at objectives hundreds of miles inland over hostile territory, perhaps the greatest challenge lies in the requirement to provide adequate fire support to units ashore when confronted by enemy forces. These highly maneuverable landing forces will require support from a limited number of fire support assets tasked with multiple missions over the entire battlespace. Successful implementation of STOM depends on the development of improved fire support systems in order to provide highly accurate, lethal long-range fires with sufficient speed and volume to suppress and neutralize fires in support of all landing force elements.<sup>6</sup>

Army Deep Operations. According to Army doctrine, "The enemy is best defeated by fighting him close and deep simultaneously."<sup>7</sup> Deep operations are used to set the conditions for decisive future operations by attacking enemy forces and functions beyond the close battle to nullify the enemy's firepower, disrupt his C2, destroy his supplies and break his morale. To the Joint Force Commander (JFC), deep operations provide a means to seize facilities, advantageous positions for indirect fire systems and bases for aircraft, and destroy key enemy functions. While well-orchestrated deep operations may help cause the enemy to be defeated outright, its success depends on the integration of firepower and maneuver including the

synchronization of supporting assets both organic to the Army and those of other services and allied forces.<sup>8</sup>

Advanced NSFS – what does it bring to the fight?

Joint Vision 2020 and the operational concepts of STOM and deep operations delineate the necessity for development of long-range, highly accurate weapon systems to support combat operations over the entire depth of the battlespace. In support of these requirements, the Navy has under development three advanced NSFS weapons that show promise in being fielded in the near term: Extended Range Guided Munitions (ERGM), Advanced Gun System (AGS), and the Tactical Tomahawk (TACTOM) program.

ERGM. ERGM is a 5 inch/62 caliber round fired from the currently employed Mk45 Mod 4 gun system which will extend naval gunfire support to ranges in excess of 60 nautical miles.<sup>9</sup> Precision fire will be achieved through a Global Positioning System (GPS)/Inertial Navigation System (INS) coupled guidance set. ERGM's extended range, precision, and all weather capability will allow Navy ships to conduct over-the-horizon fire support for littoral operations and joint fires in support of ground operations up to 60 nautical miles inland, if littoral access permits.

AGS. AGS is a 155mm Gun Weapon System designed to deliver high volume, sustainable, GPS/INS guided precision fires at ranges up to 100 nautical miles. Scheduled for delivery in FY 2007, AGS will provide the Navy a weapon system capable of tactical and operational fires in support of combat operations deep into the battlespace.<sup>10</sup>

TACTOM. The TLAM is already employed as the surface Navy's premier strike capability. The TACTOM program is an initiative to reduce cost while improving the TLAM by increasing the range to 1500 nautical miles, providing the capability for in-flight re-

targeting and battlefield loitering, and provided battle damage assessment via a missile mounted camera. The program will reach IOC in FY2004 with plans to procure over 1300 missiles.<sup>11</sup> TACTOM will enhance the Navy's capability to provide the Joint Force Commander (JFC) an effective strategic, operational and tactical joint fires asset.

The development of these advanced NSFS weapons provide the operational commander robust joint fires alternatives to employ in the pursuit of tactical and operational objectives. These NSFS weapons provide long range, precision fires effective in all weather conditions. The ERGM and AGS also provide an asset capable of a sustainable, high volume of fire. In addition, a quantitative analysis of the impact of ERGM's extended range on potential land mass target area in Vietnam, Korea and Iraq revealed that ERGM increased the Navy's land mass area of coverage in each country by a factor of eight to ten times more than present Naval Gun Fire Support (NGFS) systems.<sup>12</sup> Given the AGS range advantage over ERGM the potential target area exposed to engagement from naval surface forces in those countries would certainly increase. The significant increase in potential target area is indicative of the value of these advanced NSFS weapons to the operational commander's joint fires mission. As these and other advanced NSFS weapons are fielded, the increased ranges and subsequent increased potential target areas re-enforces the need to clarify joint doctrine in order to facilitate the safe and effective employment of these valuable joint fires assets.

#### Integrating NSFS into the joint fight - Establishing Unity of Effort.

Joint fires doctrine has been an area of significant study and debate since the end of Operation Desert Storm. Lessons learned from participants in Operation Desert Storm emphasized the importance of establishing anti-fratricide procedures, including a clear



definition of and compliance with the FSCL.<sup>13</sup> Indeed, much progress has been made in establishing doctrine to strengthen joint fires coordination and reduce fratricide. Joint fires command and control organization has seen the most significant changes including the formal designation of the Joint Targeting Coordination Board (JTCB) and Joint Fires Element (JFE) organized under the direction of the Joint Forces Commander's Operations Directorate (J-3). However, a major issue remains unresolved, the differentiation between deep and close operations. The failure of the services to settle this extremely parochial issue by formally defining the boundary between close and deep operations and designating the control authority for joint fires in support of deep operations has resulted in ambiguous joint doctrine and subsequent doctrinal differences between combatant commanders. While the center of controversy remains focused on the perceived line of demarcation, the FSCL, this debate has also spurred differences in the establishment and control of other FSCMs including Killboxes. Modifying joint doctrine to establish clear, unambiguous definitions and control procedures for deep operations and the use of Killboxes is necessary to obtain unity of effort in the safe and effective employment of not only advanced NSFS weapons but extended range weapons employed by all services.

#### Deep Operations and the FSCL – Who's in control?

The underlying issue which has prevented the armed services from agreeing to a delineation between deep and close operations is desire for autonomy of control of its own assets. As ground components gain longer-range weapons and technology increases their ability to see deeper into the battlespace, their interest in deep operations increases accordingly.<sup>14</sup> The advent of longer range weapons and each service's desire to control their own assets has complicated efforts to define the boundary between close and deep operations

and designate a control authority for deep operations. Given the controversial nature of this issue, it is not surprising to find the varied definitions of deep operations incorporated in the different service's doctrine to justify control of deep operations. Army doctrine defines both close and deep operations stating that deep operations are "those directed against enemy forces and functions beyond the close battle" while close operations are "forces in immediate contact with the enemy."<sup>15</sup> According to Army doctrine, deep operations are used to set the conditions for decisive future operations.<sup>16</sup> Ground commanders want control of all assets they consider necessary to accomplish the mission the JFC assigns them. "In conducting simultaneous attacks in depth, Army forces employ long-range, intelligence-acquisition and targeting assets, including electronic warfare and joint assets, to track enemy forces, to complicate their missions, and to determine the effects of our strikes in depth."<sup>17</sup> Therefore, the Army's desire to control joint assets in the conduct of deep operations as specified in their doctrine eliminates the requirement to specify a transition point between close and deep operations, as the Army would control both.

While the Navy does not define deep operations in its doctrine, the Marine Corps uses a definition very similar to the Army. The Marine Corps defines deep operations as those conducted against enemy capabilities that pose potential threat to friendly forces. The purpose of deep operation is to isolate, shape, and dominate the battlespace and influence future operations.<sup>18</sup> While the Marine Corps does designate the Marine Air-Ground Task Force (MAGTF) Command Element (CE) as the control authority for deep operations it fails to identify a transition point simply stating that "deep, close, and rear operations are not necessarily characterized by distance or location on the battle field. Rather, they are a

functional in nature.”<sup>19</sup> Again, a transition point is not necessary in the Marine Corps doctrine as the MAGTF CE controls both close and deep operations.

Finally, while Air Force doctrine does not specifically define deep operations, its definition of interdiction operations directly corresponds to the Army and Marine Corps’ concept of deep operations. According to Air Force doctrine, “Interdiction disrupts, delays, or destroys the enemy’s military potential before it can be used against friendly forces.”<sup>20</sup> Thus, both interdiction operations and deep operations are directed against enemy forces and function beyond the close battle. Like the Army, the Air Force believes it is the most qualified service to control interdiction or deep operations. “To achieve efficiencies and enhance effectiveness, the air component commander should control all forces performing interdiction and integrate interdiction with surface force operations to achieve the theater commander’s objectives.”<sup>21</sup> In order for the ground force commander to control close operations and the Air Force to control deep operations, a transition point must be defined. The Air Force views the FSCL as that transition point at which other services possessing assets with the range capable of engaging targets beyond the FSCL should play a supporting role to the primacy of air battle that is taking place.<sup>22</sup> Thus, desire for autonomy of control of its own weapon systems has produced disagreement between the services over control of deep operations and subsequently shifted the focus of the controversy to the application of the perceived joint fire control boundary, the FSCL.

The FSCL is a permissive FSCM used to facilitate the expeditious attack of targets of opportunity beyond the coordinating measure.<sup>23</sup> Although Joint Pub 3-09 specifically stipulates that the FSCL does not divide an area of operations (AO), it has become the dividing line for joint fires control. With the development of deep fire weapons, coordination

around the FSCL has become cumbersome and confusing. Establishing the FSCL anywhere short of the maximum range of the ground commander's organic assets introduces increased risk of fratricide as long-range surface-to-surface weapons are employed in the airspace beyond the FSCL. Meanwhile, establishing the FSCL at the maximum range of the long range weapons organic to the ground commander creates a tremendous amount of space for the enemy to establish safe havens and places unnecessary limitations on aircraft's ability to attack targets short of the FSCL. Attempts to balance autonomy of control with fratricide concerns have resulted in conflicts between current service doctrine and joint doctrine regarding coordination requirements beyond the FSCL.

Short of the FSCL, joint doctrine is very clear in stating "air-to-ground and surface-to-surface attack operations are controlled by the land or amphibious force commander."<sup>24</sup> However, for forces attacking targets beyond the FSCL, joint doctrine only requires notification of all affected commanders while containing a clause that permits attack of targets beyond the FSCL without coordination in exceptional circumstances.<sup>25</sup> In instances where the FSCL is short of the land component commander's (LCC's) forward boundary (FB), since the LCC is responsible for the synchronization of operations within his AO, the LCC would be able to conduct fires beyond the FSCL out to his FB without notification of the Air Component Commander (ACC) using the exceptional circumstances clause. This is an obvious fratricide concern for aircraft operating beyond the FSCL. Thus, the official Air Force position has been that, if synchronization of all fires inside the FSCL is critical to the LCC, the same synchronization should be critical to the ACC beyond the FSCL.<sup>26</sup> However, by not delineating who controls fires beyond the FSCL and maintaining an exceptional circumstances clause, the current joint definition leaves room for individual service

interpretation and thus none seem inclined to change the definition. Consequently, this only reinforces each of their views on how the battlespace should be controlled and minimizes the joint interoperability that is preached.

The ambiguity of the current joint definition of FSCL has led to doctrinal differences between combatant commanders. Examining the doctrinal differences between U.S. Central Command's (CENTCOM) Concept of Operations (CONOPS) for Joint Fires and ROK-US Combined Forces Command (CFC) Publication 3-1, Deep Operations Korea, illustrates the consequence of joint doctrine ambiguity. For operations short of the FSCL, both combatant commanders strictly adhere to the guidance in Joint Pub 3-09 establishing the appropriate land or amphibious force commander as the controlling authority for all air-to-ground and surface-to-surface attack operations.<sup>27</sup> As expected, it is in the doctrine that addresses battlespace beyond the FSCL and more specifically the area between the FSCL and the LCC's FB where doctrinal differences occur. In CENTCOM, execution of flights and fires between the FSCL and the LCC's FB is coordinated between the LCC Deep Operations Coordination Center or Force Fires Coordination Center and Combat Operations of the Air Operations Center. When attacking targets beyond the FSCL, CENTCOM's CONOPS reiterates the doctrine set forth in Joint Pub 3-09 requiring coordination with all affected commanders to avoid fratricide but provides the exceptional circumstances clause in which the inability to coordinate will not preclude attacks beyond the FSCL. Thus, CENTCOM only requires coordination for joint fires between the FSCL and LCC's FB not control.<sup>28</sup>

On the other hand, ROK-US CFC's doctrine not only requires coordination for flights and fires beyond the FSCL with the Commander, Air Component Command (CACC), it also specifies the requirement for approval of all fires by the Commander, Ground Component

Command (GCC) between the FSCL and the GCC's FB.<sup>29</sup> ROK-US CFC doctrine does not permit fires without approval even in exceptional circumstances, a major distinction from CENTCOM. These doctrinal differences between combatant commanders are indicative of the ambiguity of joint doctrine. Doctrinal differences between theaters of operation degrade unity of effort and present unnecessary challenges to the coordination of joint fires that will only be exasperated as the Navy and other services field additional extended range weapons.

#### Killboxes – the future of joint fires coordination?

Instituting unambiguous joint doctrine that specifies the physical dividing line between close and deep operations and delineates control authority is the first step in solidifying unity of effort in joint fires coordination. Another concept that could significantly enhance unity of effort in the employment of extended range weapons and alleviate inter-service concerns over autonomy of action, has yet to be addressed in joint doctrine. The concept of the Killbox as a type of FSCM is being employed today by combatant commanders to coordinate, deconflict, and synchronize joint fires. However, the term Killbox is not only undefined in joint doctrine, it is not identified as a joint term.<sup>30</sup> The failure to identify and define this type of FSCM in joint doctrine has resulted in combatant commanders, CENTCOM and ROK-US CFC specifically, using a common term with varied applications in doctrine.

CENTCOM employs Killboxes in the form of a Killbox reference system used in a given AO. The Killboxes are based upon a 30 x 30 min (nm) air-air grid system defined by 00' and 30' latitude and longitude lines, altitude block, and assigned coded identifiers for each grid. These three-dimensional Killboxes can be subdivided to facilitate target location, attack and deconfliction. In CENTCOM, the Killboxes are permanently established in the

area of operations and employed both short of and beyond the FSCL; a major point of departure from ROK-US CFC Killbox doctrine. The opening and closing of a Killbox is controlled by the LCC or MAGTF commander within his AO and by the ACC beyond the LCC's FB. Short of the FSCL, the Killboxes do not restrict aircraft flight as the Airspace Coordination Areas (ACAs) used in Korea do; they are simply used to control fires. An open Killbox short of the FSCL is clearance for specified Close Air Support assets to fire on specific target sets without direct positive terminal control. A closed Killbox short of the FSCL reinstates the requirement for direct positive control for tactical air to expend ordnance. Beyond the FSCL, an open Killbox permits air attacks against targets in accordance with LCC targeting priorities. A closed Killbox beyond the FSCL restricts ACC air assets from transiting or employing ordnance unless already deconflicted and coordinated through the targeting and Air Tasking Order development cycles. A closed Killbox beyond the FSCL however, does not restrict ground commander organic assets unless otherwise specified. Thus, beyond the FSCL the closed Killbox is used to deconflict airspace and permit long-range surface-to-surface fires.<sup>31</sup>

The Killbox concept is also formalized in ROK-US CFC doctrine; however, its use is distinctly different than in CENTCOM. First, Killboxes in Korea are not on a stand-alone grid reference system but are established when required in conjunction with the Korean Common Grid Reference System (KCGRS). The term Killbox is only used for those FSCMs established beyond the FSCL. Short of the FSCL, ACAs are established. Unlike CENTCOM, both ACAs and Killboxes are established to provide a block or corridor in which friendly aircraft are reasonably safe from friendly surface fires. The distinction between ACAs and Killboxes in Korea is based on the level of control required of the aircraft

working in the area. When establishing an ACA, the GCC must designate the level of control required for the aircraft to expend ordnance on a surface target in that area. However, when a Killbox is established, it allows the aircraft to operate and engage targets without the positive control and coordination required when friendly forces are a factor. Control authority of ACAs/Killboxes is similar to CENTCOM in that the GCC controls the establishment and disestablishment out to the forward boundary of his AO. Beyond the forward boundary, the CACC is the control authority.<sup>32</sup>

The concept of Killboxes in conjunction with a grid reference system provides a joint fires coordination asset that poses distinct advantages for use in the employment of not only advanced NSFS weapons but also extended range weapons from other services. For example, in CENTCOM, Killboxes simplify airspace deconfliction for the employment of extended range weapons by requiring only the closing of Killboxes or portions of Killboxes that would be penetrated by the trajectory of the surface-to-surface fire. For advanced NSFS weapons, given the majority of its trajectory will be above normal operating altitudes of tactical aircraft, the coordination requirements for employment of a weapon that could cross several unit boundaries could be as simple as closing as few as two Killboxes in the immediate vicinity of the firing location and target impact area to prevent fratricide.<sup>33</sup> Additionally, these three dimensional grid boxes can be opened and closed in minutes, thereby limiting enemy sanctuaries, maximizing the application of fires, and reducing the chance of fratricide.<sup>34</sup> While neither combatant commander may have the best solution, a unified concept should be formalized given its utility to joint fires coordination. Formalizing the Killbox concept in joint doctrine would eliminate the continued variance in combatant



commander doctrine and significantly enhance the operational commander's efforts to maximize unity of effort, economy of force, and the principle of mass.

### Conclusion

Joint Vision 2020 and the operational concepts of STOM and deep operations demonstrate the necessity for development of weapon systems to support combat operations over the entire depth of the battlespace. In support of these requirements, the Navy has undertaken the development of advanced NSFS weapons that will be capable of providing a sustainable high volume rate of long range, precision fires in all weather conditions. Optimizing the employment of the advanced NSFS combat power will enable the operational commander to maximize economy of force and principle of mass. The challenge to optimizing the employment of advanced NSFS combat power resides in establishing unity of effort for fires and airspace deconfliction throughout the battlespace. The failure of joint doctrine to adequately address three critical deconfliction issues, delineation of the boundary between close and deep operations, designation of the control authority for fires in deep operations, and the use of Killboxes, has resulted in doctrinal differences that pose unnecessary challenges to fires deconfliction. Expanding joint doctrine to address these battlespace challenges is critical to the employment and synchronization of joint fires from not only advanced NSFS weapons but also extended range weapons of all services.

### Recommendations

Joint fires coordination is important to operational commanders to accomplish objectives with the greatest unity of effort and economy of force. Synchronization of maneuver and fires is essential to the success of any operation. Therefore, joint doctrine

should be modified to resolve any challenges to joint fires coordination and synchronization.

Possible solutions include:

1. Designate the FSCL as the formal boundary between close and deep operations.  
The land or amphibious force commander will maintain control of the placement of the FSCL and control of all fires within his AO short of the FSCL.
2. Designate the ACC as the control authority for all fires beyond the FSCL and remove the exceptional circumstance clause that would permit firing without permission. This ensures unity of effort and provides positive control to the activity most susceptible to fratricide beyond the FSCL.
3. Establish the Killbox grid reference system as a formal FSCM. LCC will maintain control of all Killboxes short of the FSCL and ACC will control all Killboxes beyond FSCL. The established Killbox reference system will provide altitude deconfliction for surface-to-surface and air-to-surface fires, providing ground commanders autonomy of control of surface fires whose trajectories do not penetrate the Killbox. This doctrine will reduce time to coordinate and synchronize joint fires while providing centralized control of both close and deep operations.
4. Establish requirements in the Fleet Battle Experiments to analyze and quantify the affect of joint fire coordination measures on the timeliness of engagements against time sensitive and time critical targets during the employment of advanced NSFS weapons. Current Fleet Battle Experiments focus on analyzing and quantifying the affect of advanced technology systems on these engagements while little

attention is paid to the advantages and disadvantages of employing various fire support coordinating measures.

Distinguishing between close and deep operations and designating the appropriate control authority is important to the safe and effective employment of advanced NSFS weapons. Service parochialism must not interfere with determining the best resolution to this issue.

## NOTES

<sup>1</sup> Concept and Employment Working Group, “Concept of Employment for Naval Surface Fire Support (Near Term Capability).” <<http://www.fas.org/man/dod-101/sys/ship/weaps/docs/C1031.htm>> [28 March 2003], 3.

<sup>2</sup> Scott C. Truver, “Accurate, Precise, and Timely,” Sea Power, 42 (September 1999): 29.

<sup>3</sup> U.S. Joint Chiefs of Staff, Joint Vision 2020 (Washington DC: U.S. Government Printing Officer: June 2000), 3.

<sup>4</sup> *ibid*, 26.

<sup>5</sup> U.S. Marine Corps, Marine Corps Concept Paper: Ship-to-Objective Maneuver (MCCP: Ship to Objective Maneuver) (Washington, D.C.: 25 July 1997), II-7.

<sup>6</sup> *ibid*, II-22.

<sup>7</sup> U.S. Department of the Army, Operations, Field Manual 100-5 (Washington, D.C.: Headquarters Department of the Army: 14 June 1993), p 6-14.

<sup>8</sup> *ibid*.

<sup>9</sup> Stephen H. Keller, “Naval Surface Fire Support: On Target,” Sea Power, 44 (September 2001): 42.

<sup>10</sup> “Advanced Gun System” <<http://surfacewarfare.nswc.navy.mil/n76/ags.html>> [2 May 2003].

<sup>11</sup> “Assured Access and Support for Maneuver” <<http://surfacewarfare.nswc.navy.mil/n76/pstrike.html>> [2 May 2003].

<sup>12</sup> George Bonsall, “The Impact of Advanced Naval Surface Fire Support on Joint Force Fire Coordination,” (Unpublished Research Paper, U.S. Army Command and General Staff College, Fort Leavenworth, KS: 1997) <[www.fas.org/man/dod-101/sys/ship/weaps/docs/NSFSJFFC.HTM](http://www.fas.org/man/dod-101/sys/ship/weaps/docs/NSFSJFFC.HTM)> [28 March 2003], 32.

<sup>13</sup> Joint Warfighting Center, Joint Force Fires Coordination Study (n.p.: 7 February 1997), II-11.

<sup>14</sup> U.S. Department of the Air Force, JFAAC Primer (Washington, D.C.: Headquarters USAF/XOXD: 10 January 1994), 33.

<sup>15</sup> Operations, FM 100-5, 6-14.

<sup>16</sup> *ibid.*

<sup>17</sup> *ibid.*

<sup>18</sup> U.S. Marine Corps, Ground Combat Operations, Fleet Marine Force Manual 6 (Washington, D.C.: Headquarters United States Marine Corps: 4 April 1995), p 3-12.

<sup>19</sup> *ibid.*, p 3-11.

<sup>20</sup> U.S. Department of the Air Force, Basic Aerospace Doctrine of the United States Air Force, Air Force Manual 1-1 Volume 1 (Washington, D.C.: Headquarters U.S. Air Force: March 1992), 12.

<sup>21</sup> *ibid.*

<sup>22</sup> Terry L. New, “Where to Draw the Line between Air and Land Battle,” Airpower Journal, (Fall 1996). <[www.airpower.maxwell.af.mil/airchronicles/apj/new-terr.html](http://www.airpower.maxwell.af.mil/airchronicles/apj/new-terr.html)> [28 April 2003], 4-5.

<sup>23</sup> U.S. Joint Chiefs of Staff, Doctrine for Joint Fire Support, Joint Pub 3-09 (Washington, D.C.: 12 May 1998), A-2.

<sup>24</sup> *ibid.*

<sup>25</sup> *ibid.*

<sup>26</sup> U.S. Department of the Air Force, JFAAC Primer (Washington, D.C.: Headquarters USAF/XOXD: 10 January 1994), 33-34.

<sup>27</sup> U.S Central Command, “Concept of Operations for Joint Fires,” 10 November 1999. <<http://www.fas.org/man/dod-101/ops/docs/jfconops.htm>> [15 April 2003], 23. ROK-US Combined Forces Command, Deep Operations Korea, CFC Pub 3-1 (n.p.: 1 July 2000), 22.

<sup>28</sup> U.S Central Command, “Concept of Operations for Joint Fires,” 23.

<sup>29</sup> ROK-US Combined Forces Command, Deep Operations Korea, 22. In Korea the JFLCC is called the “Commander, Ground Component Command” (GCC) and the JFACC is called the “Commander, Air Component Command” (CACC). GCC and ACC will be used interchangeably with JFLCC/LCC and JFACC/ACC respectively.

<sup>30</sup> Killbox is not defined in Joint Pub 3-0, Doctrine for Joint Operations, Joint Pub 3-09, Doctrine for Joint Fire Support, Joint Pub 3-09.3, Joint Tactics, Techniques, and

Procedures for Close Air Support, Joint Pub 3-52, Doctrine for Joint Airspace Control in the Combat Zone, or Joint Pub 3-56.1, Command and Control for Joint Air Operations.

<sup>31</sup> U.S Central Command, “Concept of Operations for Joint Fires,” 24-26.

<sup>32</sup> ROK-US Combined Forces Command, Killbox Operations - Korea, CFC Pub 3-1.1 (n.p.: 1 July 2000), 4-9.

<sup>33</sup> Concept and Employment Working Group, “Concept of Employment for Naval Surface Fire Support (Near Term Capability),” 35.

<sup>34</sup> Mick Quintrall, “A Change-Challenge: The Fire Support Coordination Box,” Air and Space Power Journal, 16 (Fall 2002): 15.

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